

REMARKS

[0001] Claims 1-23 are pending in the case. In the Office Action, Claim 6 was objected to for informalities, Claims 1-3, 6, 9-11, 15, 18, and 19 were rejected under 35 U.S.C. §102(e), and Claims 4, 5, 7, 8, 13, 14, 16, 17, and 20-23 were rejected under 35 U.S.C. §103(a). Applicants have amended Claims 1, 9, 18, 19. No new matter was added. The pending claims, as amended, are believed to be in condition for allowance, and applicant respectfully requests the prompt allowance of claims 1-20.

REJECTION OF CLAIMS UNDER 35 U.S.C. §102(e)

[0002] The Examiner rejected Claims 1-3, 6, 9-11, 15, 18, and 19 under 35 U.S.C. §102(e) as anticipated in view of U.S. Patent No. 5,991,891 to Hahn et al. (hereinafter Hahn). Applicants respectfully traverse this rejection.

[0003] It is well settled that under 35 U.S.C. §102 "an invention is anticipated if . . . all the claim limitations [are] shown in a single art prior art reference. Every element of the claimed invention must be literally present, arranged as in the claim. The identical invention must be shown in as complete detail as is contained in the patent claim." *Richardson v. Suzuki Motor Co., Ltd.*, 9 U.S.P.Q.2d 1913, 1920 (Fed. Cir. 1989). Applicants respectfully assert that Hahn does not teach or disclose each element of the independent claims.

[0004] Claim 1, as amended, recites in pertinent part:

A host interface adaptive hub, comprising:

a first loop residing within the host interface adaptive hub;
a second loop residing within the host interface adaptive hub;
a first host server interface terminal coupled to the first loop, the first loop actively transporting data between a first host server and a first storage controller;
a second host server interface terminal coupled to the second loop, the second loop actively transporting data between a second host server and a second storage controller;
a loop healing switch coupled to the first loop and the second loop, wherein upon detection of a failure of the first storage controller, the loop healing switch couples the first loop and the second loop and the second storage controller presents logical units associated with the first storage controller to the second host server, the second storage controller servicing data storage requests from the first host server and the second host server.

See Amended Claim 1.

In particular, Claim 1 recites that the first loop and second loop are within the host interactive hub, that the two loops actively or continuously transport data, and that logical units associated with one failed storage controller are presented to the second host server and are accessible to both host servers. Applicants respectfully submit that these features are not taught or suggested by Hahn.

[0005] Hahn teaches loop coherency using a primary loop that carries data and a normally unutilized secondary loop. *See Hahn Abstract.* A loop coherency circuit reroutes data flow to a secondary loop segment and back to a primary loop segment to provide a continuous coherent arbitrated loop. *See Hahn Abstract.* Of note, Hahn teaches two complete and distinct fibre channel loops 110, 116 in Figure 2. These loops 110, 116 externally connect enclosures housing a plurality of fibre channel devices 108. *See Hahn Col. 3, lines 42-55.* Furthermore, while the primary loop 110 is principally used for data communication, the secondary loop 116 is “utilized only upon a condition of loop incoherency (e.g. a break in the primary loop or a node failure).” *See Hahn Col. 4, lines 1-3.* When a failure occurs, the primary loop and secondary loop cooperate to provide a complete path. *See Hahn Col. 4, lines 3-7.* Finally, Hahn teaches fibre channel arbitrated loop coherency without use of a central hub. *See Hahn Col. 2, lines 60-61.*

[0006] In contrast, Claim 1 recites multiple features that are not taught or suggested in Hahn. Additionally, the amendments to Claim 1 clarify these distinctions. First, Claim 1 recites that the first loop and second loop are internal to the host interface adaptive hub. *See Specification, page 5, lines 9-11.* The cabling or wiring for the first and second loops of the present invention is shorter because the hub is relatively small in comparison to the enclosures. In Hahn, the cables travel externally from enclosure to enclosure. *See Hahn Figure 2.* Consequently, the internal configuration of the present invention saves considerable expense over the external configuration of Hahn because less cabling is used. Especially, in view of the fact that Hahn only uses one of the two cables during normal operations.

[0007] Second, Claim 1 clarifies that the first loop and second loop both actively transport data between a host server and a storage controller. Because both loops actively transport data the claimed invention provides for twice the bandwidth of a single loop

configuration. *See Specification, page 5, lines 19-22.* This bandwidth increase is further advantageous where multiple servers connect to one of the loops of the claimed invention. *See Specification, page 5, line 22 – page 6 line 1.*

[0008] In contrast, Hahn repeatedly teaches that only a single active loop exists at any given time. During normal operation, the single loop is the primary loop. See Hahn Col. 4, lines 1-3. In response to a failure, the single loop is a combination of segments of the primary loop and the secondary loop. See Hahn Col. 4, lines 3-7. Consequently, Hahn never teaches that both loops are simultaneously actively carrying data. Therefore, Hahn does not provide the increased bandwidth provided in the claimed invention. Of course a failure within the claimed invention causes the loop healing switch to reduce the bandwidth to that of a single loop. *See Specification, page 3, lines 22-23.* But, Hahn fails to ever provide double the bandwidth as the claimed invention does.

[0009] Finally, Claim 1 recites that the loop healing switch detects a failure of a storage controller. The loop healing switch then couples the two loops. *See amended Claim 1.* This coupling forms a single loop comprising the host servers of the first loop and the host servers of the second loop. Additionally, the surviving storage controller, the second storage controller in Claim 1, presents logical units associated with the failed storage controller, the first storage controller in Claim 1, to host servers connected to the first loop and the second loop. *See Specification, page 4, lines 1-9.* In this manner, hosts connected to a loop encountering a failure still have an access path to all the logical units originally managed by the failed controller. Consequently, the claimed invention combines the benefits of double the bandwidth during normal operation and loop coherency in response to a failure.

[0010] In contrast, Hahn teaches use of loop coherency circuits 122 that interconnect different segments of a primary loop to segments of a redundant loop such that a single loop is maintained. The recent Office Action relies on Figure 5 and the supporting description in Hahn at col. 5, lines 11-42 for teachings of elements to reject Claim 1.

[0011] Applicants note that Hahn fails to teach a first and second storage controller as recited in amended Claim 1. Applicants submit that neither the loop coherency circuit 122 nor the multiplexers 124, 126 of Hahn comprise the necessary logic

to operate as a storage controller. The multiplexers 124, 126 reroute data from one loop to the other. *See Hahn col. 4, lines 17-19.* The loop coherency circuit 122 detects changes in communication and activates the appropriate multiplexer 124, 126 to reroute data flow between the loops. *See Hahn col. 4, lines 31-36.* Therefore, the loop coherency circuit 122 and multiplexers 124, 126 relate to managing loop coherency rather than managing storage devices. Since Hahn fails to teach or suggest storage controllers, Hahn also fails to teach or suggest storage controllers configured to present logical units associated with a failed storage controller to host servers connected to the first loop and the second loop such that an access path to all the logical units is maintained. The claimed invention describes one embodiment that accomplishes this using a failover process described in the specification on page 4 at lines 1-9.

[0012] Applicants submit that amended independent Claim 1 is patentable over Hahn because Hahn fails to teach or suggest all of the elements of amended independent Claim 1. In particular, Hahn does not teach a first loop and second loop within the host interactive hub, the two loops actively or continuously transporting data, and presentation of logical units associated with one failed storage controller such that the logical units are accessible to both host servers.

[0013] Applicants submit that amended independent Claims 1, 9, 18, and 19 recite substantially the same subject matter with similar limitations. Therefore, Applicants submit that amended Claims 9, 18, and 19 are allowable for at least the same reasons explained above in relation to Claim 1. Given that dependent Claims 2-3, 6, 10-11, and 15 depend respectively from independent Claims 1, 9, 18, and 19, Applicants respectfully submit that Claims 2-3, 6, 10-11, and 15 are also patentable over Hahn. Therefore, Applicants request that the rejection of Claims 1-3, 6, 9-11, 15, 18, and 19 under 35 U.S.C. §102(e) be withdrawn.

REJECTION OF CLAIMS UNDER 35 U.S.C. §103(a)

[0014] The Office Action rejected Claims 4, 5, 7, 8, 13; 14, 16, 17, and 20-23 under 35 U.S.C. §103(a) as obvious in view of Hahn and further in view of U.S. Patent

No. 6,289,002 to Henson et al. (hereinafter Henson). Applicants respectfully traverse this rejection.

[0015] Applicants respectfully assert that neither Hahn nor Henson teach or suggest all of the elements of the rejected claims in view of the amendments and the following remarks. To establish obviousness, the combination of the prior art references must teach or suggest all the claim limitations. See MPEP § 2142.

[0016] Applicant respectfully asserts that Hahn and Henson fail to teach or suggest all the claim limitations of the amended independent Claims 1, 9, 18, and 19. Specifically, the references fail to teach or disclose a first loop and second loop within the host interactive hub, the two loops actively or continuously transporting data, and presentation of logical units associated with one failed storage controller such that the logical units are accessible to both host servers.

[0017] The Office Action relies heavily on Hahn to reject independent Claims 1, 9, 18, and 19 under 35 U.S.C §102(e) and then relies on this argument in support of a rejection of Claims 7, 8, 16, 17, 22, and 23. Applicants assert that because Hahn fails to include the novel elements that are part of amended independent Claims 1, 9, 18, and 19 and Henson fails to teach or suggest the missing elements, Claims 7, 8, 16, 17, 22, and 23 are nonobvious in view of Hahn and Henson due to the dependency.

[0018] Of particular note, Claim 8 recites the feature that bandwidth is twice that of a single loop when the two loops are in normal operation. As described above, this feature is a significant benefit over Hahn. This benefit aides performance during normal operation and provide loop coherency if a failure occurs. Hahn and Henson fail to teach or suggest two active loops that together provide twice the bandwidth of a single loop.

[0019] Henson teaches a loop network hub with an automatic bypass feature. The loop network hub detects a failure and performs the bypass feature without passing the failure along to the remainder of the loop. *See Henson Abstract.*

[0020] The Office Action relies heavily on Hahn to reject independent Claims 1, 9, 18, and 19 under 35 U.S.C §102(e) and then relies on this argument to support a rejection of Claims 4, 5, 13, 14, 20, and 21. Applicants assert that because Hahn fails to include the novel elements that are part of amended independent Claims 1, 9, 18, and 19

and Henson fails to teach or suggest the missing elements, Claims 4, 5, 13, 14, 20, and 21 are nonobvious in view of Hahn and Henson due to the dependency.

[0021] Applicants respectfully submit that Hahn and Henson fail to teach or suggest the elements included in the amended claims. Therefore, Claims 4, 5, 7, 8, 13, 14, 16, 17, and 20-23 under 35 U.S.C. §103(a) are nonobvious.

CONCLUSION

[0022] As a result of the presented amendments and remarks, Applicant asserts that amended claims 1-23 are patentable and in condition for prompt allowance. In the event any questions remain, the Examiner is respectfully requested to initiate a telephone conference with the undersigned.

Respectfully submitted,


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